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PCB Releases During Environmental Dredging of Contaminated Sediments in the Fox River, WI

EPA Forum on Managing Contaminated Sediments at Hazardous Waste Sites

Washington, D.C.

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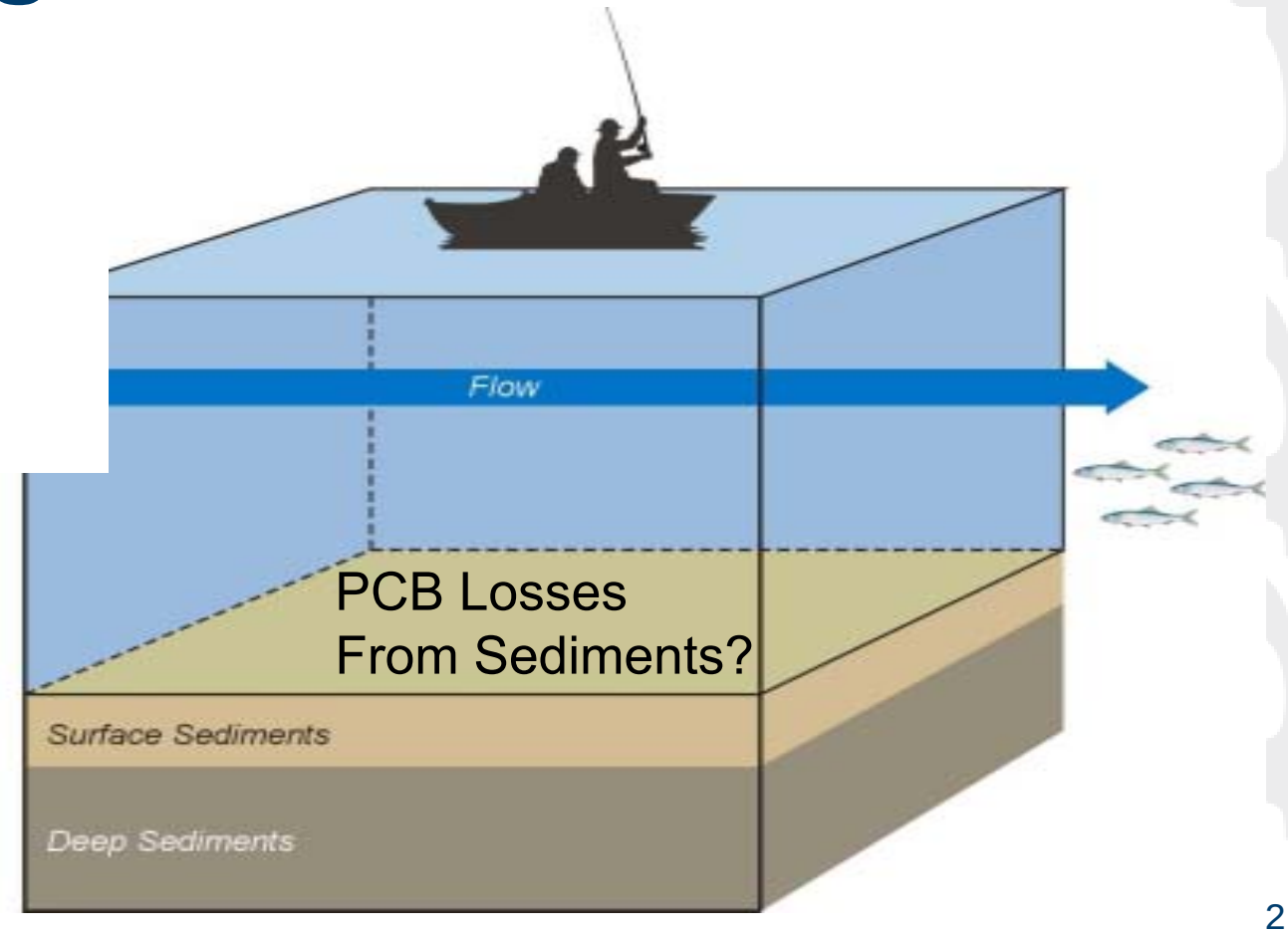
Why Measure Releases During Dredging?

<u>Compare Exposure Resulting From:</u>
-Natural Recovery
-Capping
-Dredging



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Fox River Demonstration Projects

- Work was conducted under an agreement between WDNR and the Fox River Group, funded by FRG
  - Deposit N: monitoring
  - Sediment Management Unit (SMU) 56/57: dredging and monitoring

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Fox River Demonstration Projects – Monitoring Program

- Design: Fox River Remediation Advisory Team (FRRAT – USGS, UW-Madison, UW Sea Grant) and FRG
- Implementation:
  - Water: USGS
  - Sediment: USGS, private contractors
  - Air: WDNR

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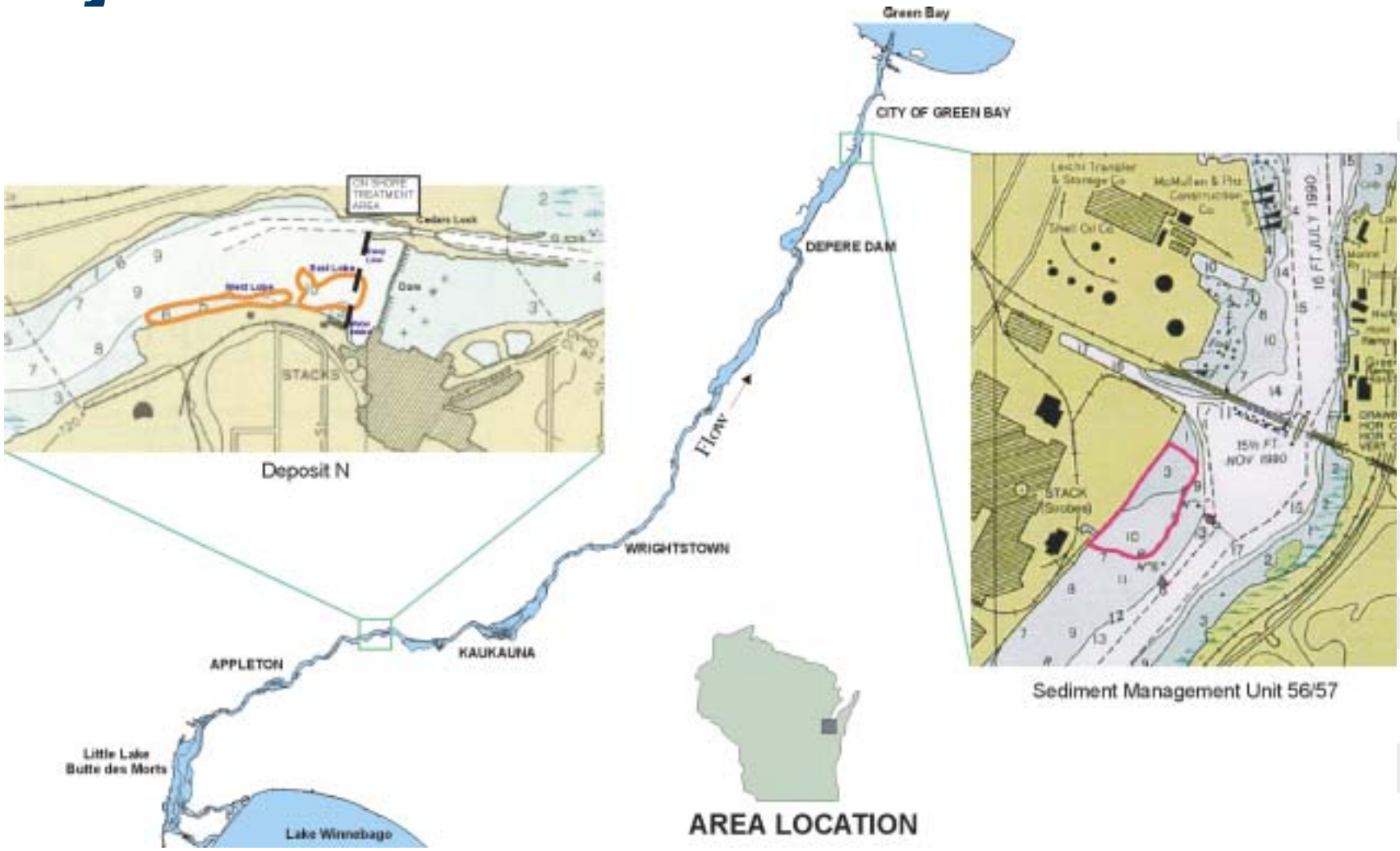
Project Locations



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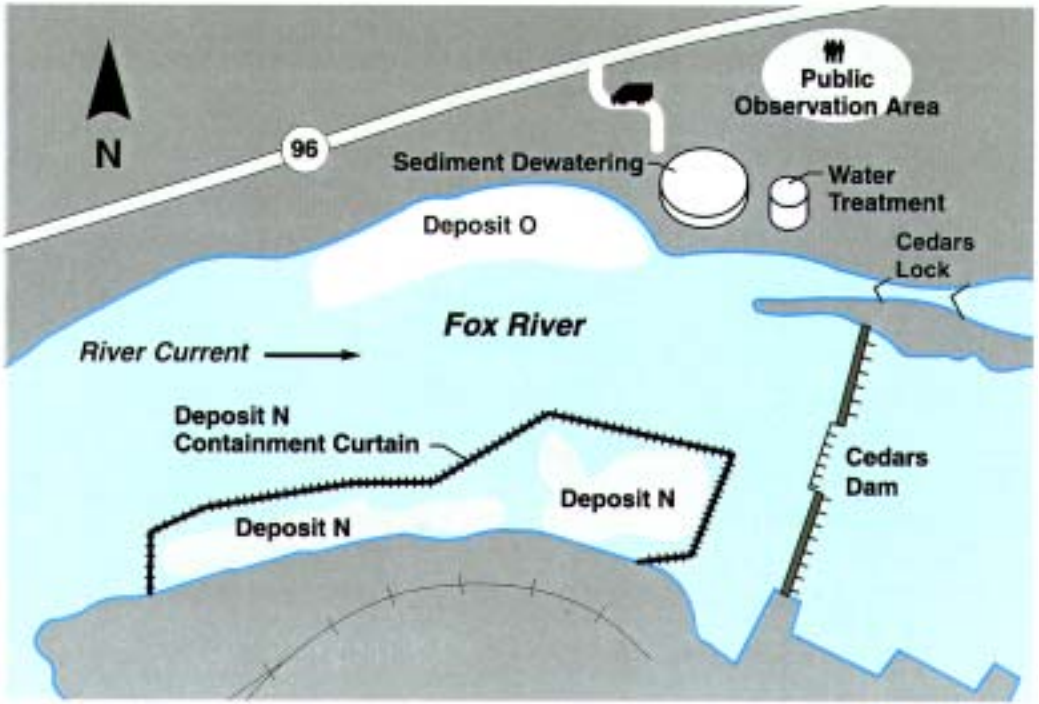
Site Characteristics

Deposit N	
Average Sediment PCB Concentration	45 ppm
Maximum Sediment PCB Concentration	180 ppm
Area	3 acres
Maximum Water Depth	8 feet
Average Sediment Thickness	2 feet
Sediment Composition	West – silt/clay; 6.9% OC East – sand; 2.2% OC
Underlying Material	Bedrock

SMU 56/57	
Average Sediment PCB Concentration	54 ppm
Maximum Sediment PCB Concentration	710 ppm
Area	9 acres
Water Depth	2 - 14 feet
Sediment Thickness	2 - 16 feet
Sediment Composition	Silt/clay; 4.2% OC
Underlying Material	Soft sediments and clay

Fox River, WI: Deposit N

- 8,200 cy removed from November to December 1998 and August to November 1999 (WDNR) (1,000 cy removed from Deposit O)
- Removed via hydraulic dredging (cutterhead)
- Silt containment included a perimeter turbidity barrier (80 mil HDPE) and two deflection barriers (80 mil HDPE and a silt curtain used primarily in 1998)



- Sediment dewatered and disposed off site
- Goal→ Remove majority of contaminated sediment and leave thin residual layer (65% of volume targeted for removal due to bedrock conditions)

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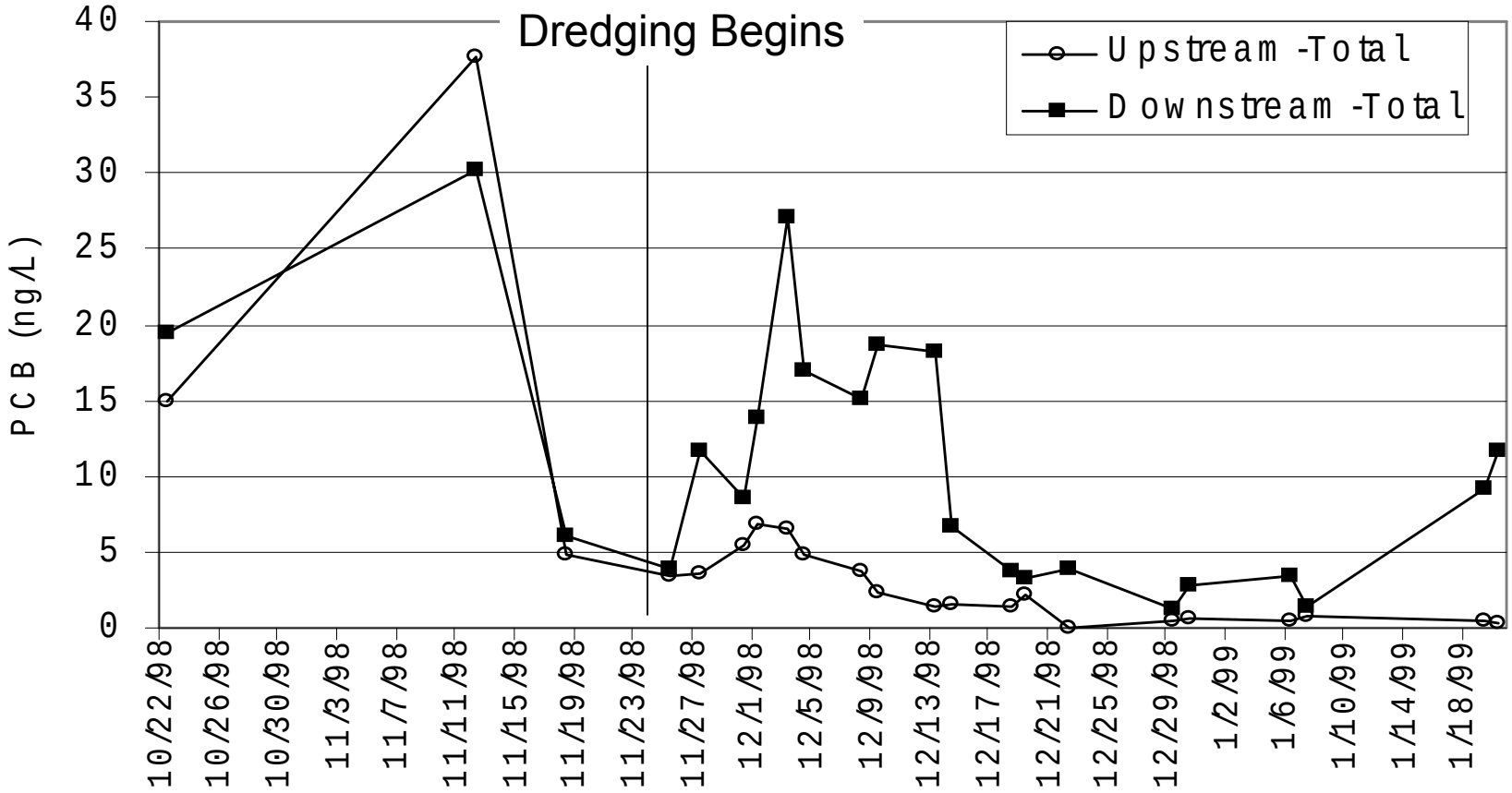
Deposit N 1998 Water Column Data - Total PCB Concentration (Dissolved + Particulate)



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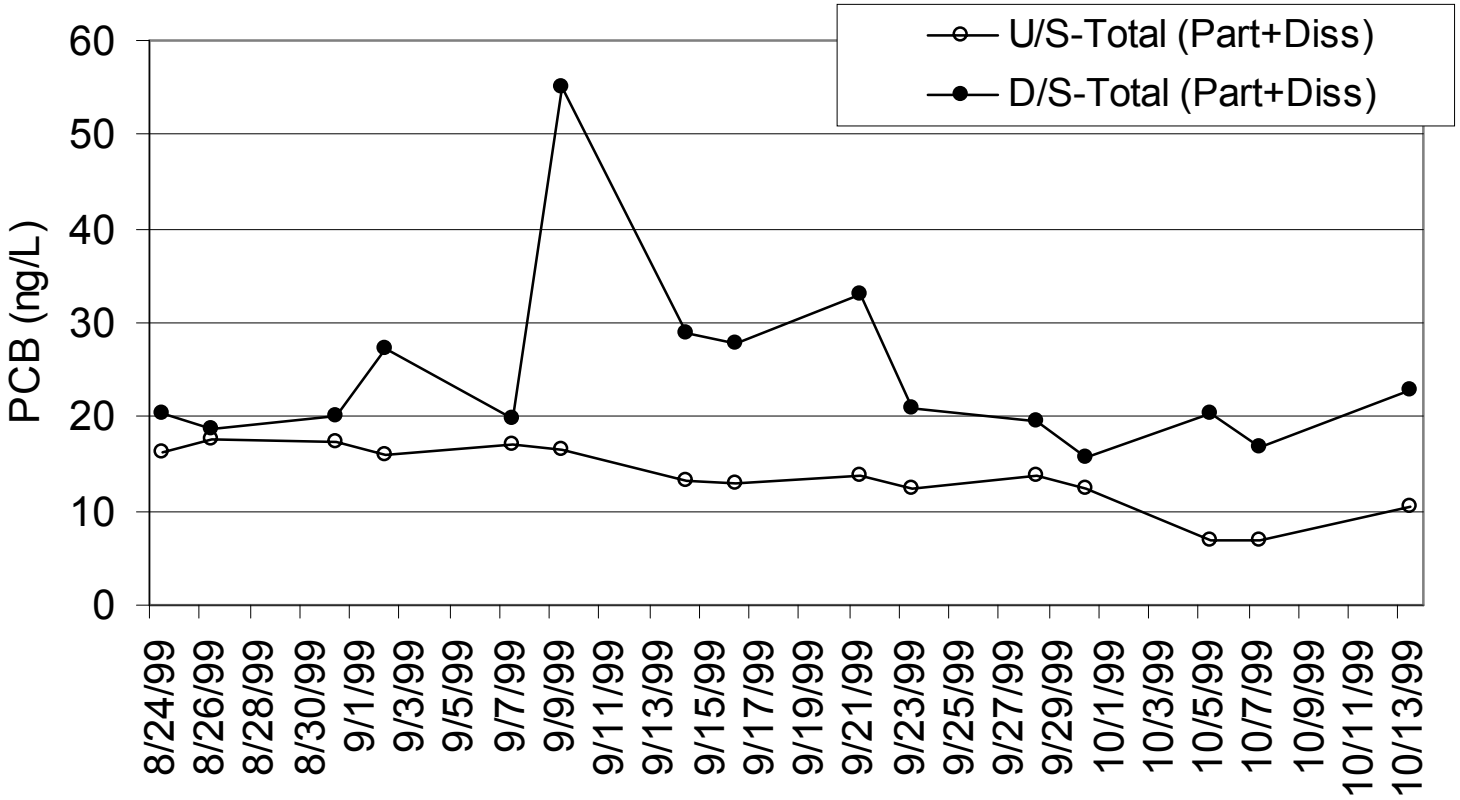
Deposit N 1999 Water Column Data - Total PCB Concentration (Dissolved + Particulate)



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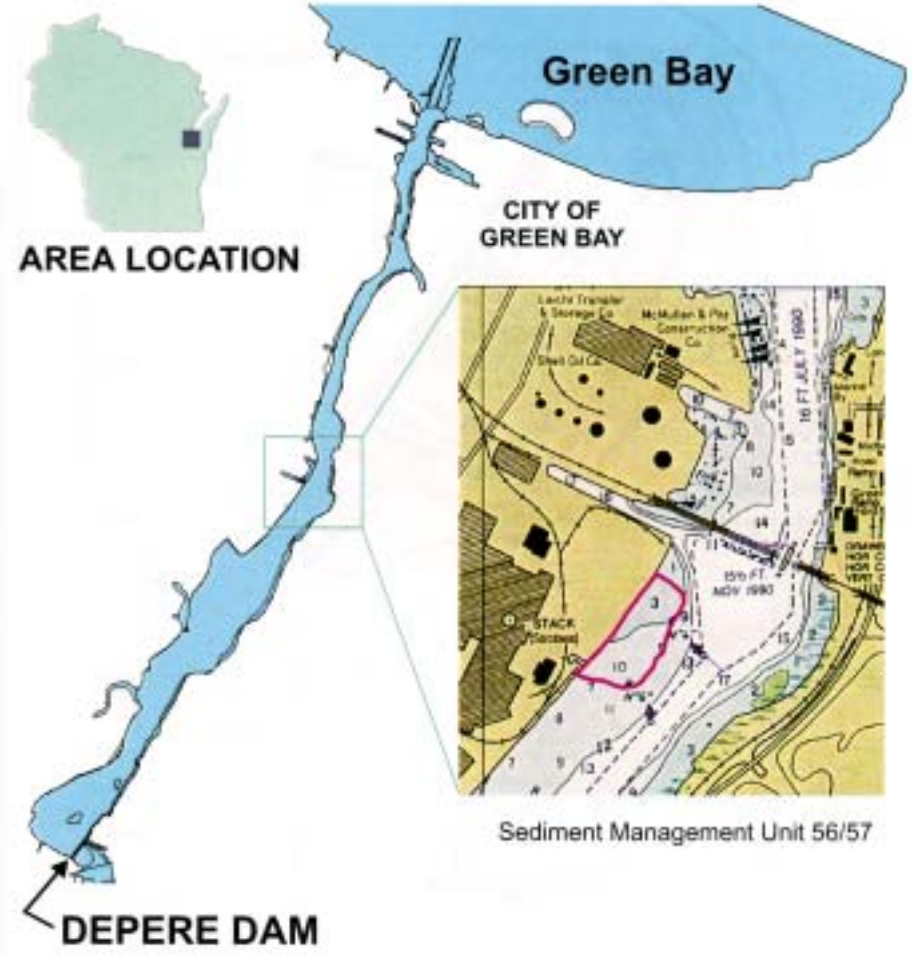
Fox River, WI: SMU 56/57 (1999)

- Removal of 31,500 cy from 11 subunits (WDNR)
- Removed via horizontal auger dredge
- Containment system used was a perimeter silt curtain
- Sediment dewatered and disposed at a landfill operated by Fort James Corporation
- Goal→ To understand the implementability, effectiveness, and cost of a large-scale sediment removal project
- Fort James completed project in 2000



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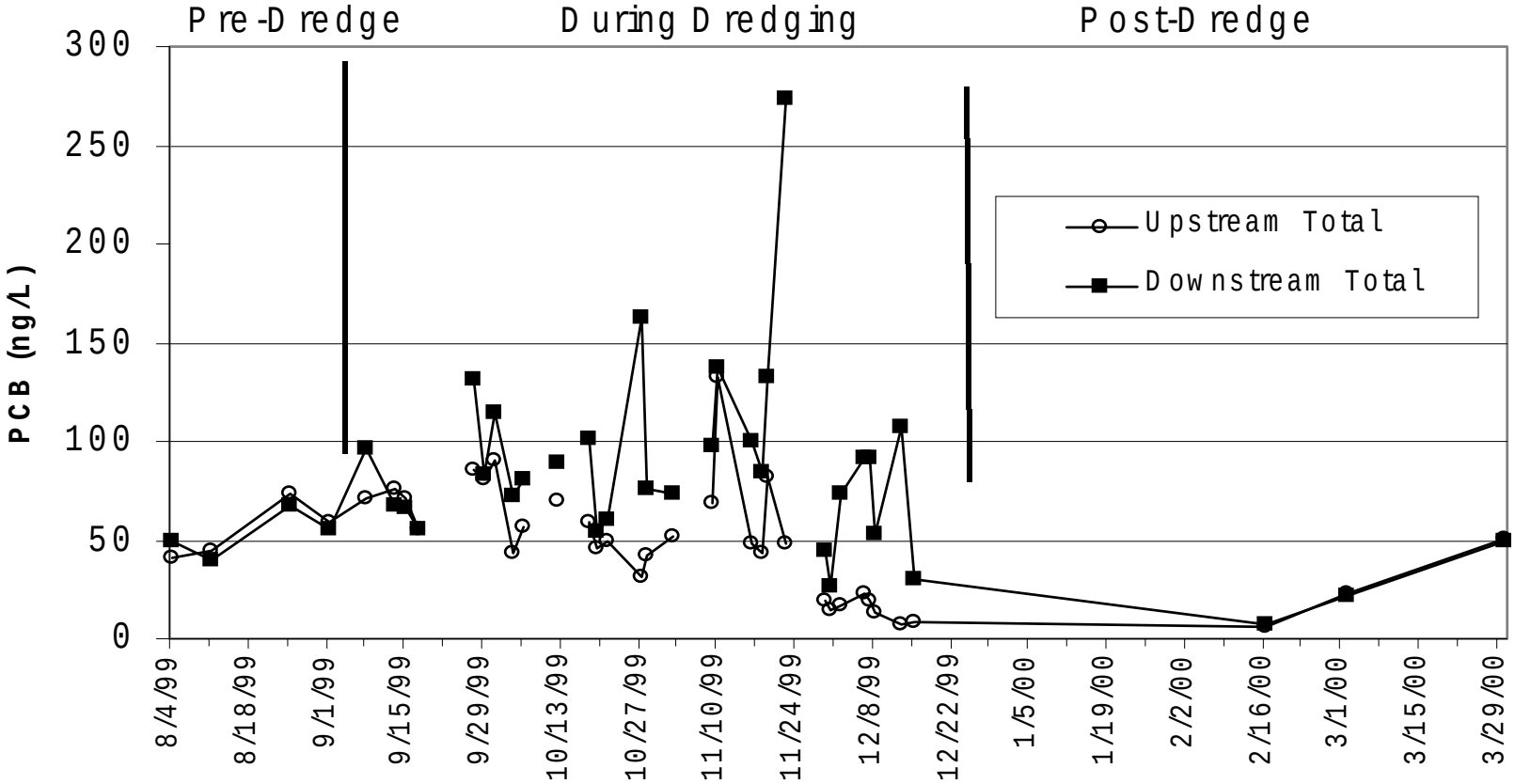
SMU 56/57 1999 Water Column Data - Total PCB Concentration (Dissolved + Particulate)



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Average PCB Concentrations (ng/L)

	Pre-dredge Upstream	Pre-dredge Downstream	During Dredging Upstream	During Dredging Downstream
Deposit N (1998)	4.2	5.0	3.2	11
Deposit N (1999)			14	24
SMU 56/57 (1999)	53	52	51	90

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PCB Released As A Percent of PCB Mass Removed

	PCB Released (kg)	PCB Removed (kg)	Percent Released
Deposit N (1998)	1.8-2.8	17-43	4.2-16
Deposit N (1999)	1.9-2.5	4.3-7.3	26-58* *low mass removed
SMU 56/57 (1999)	14-22	650	2.2-3.5

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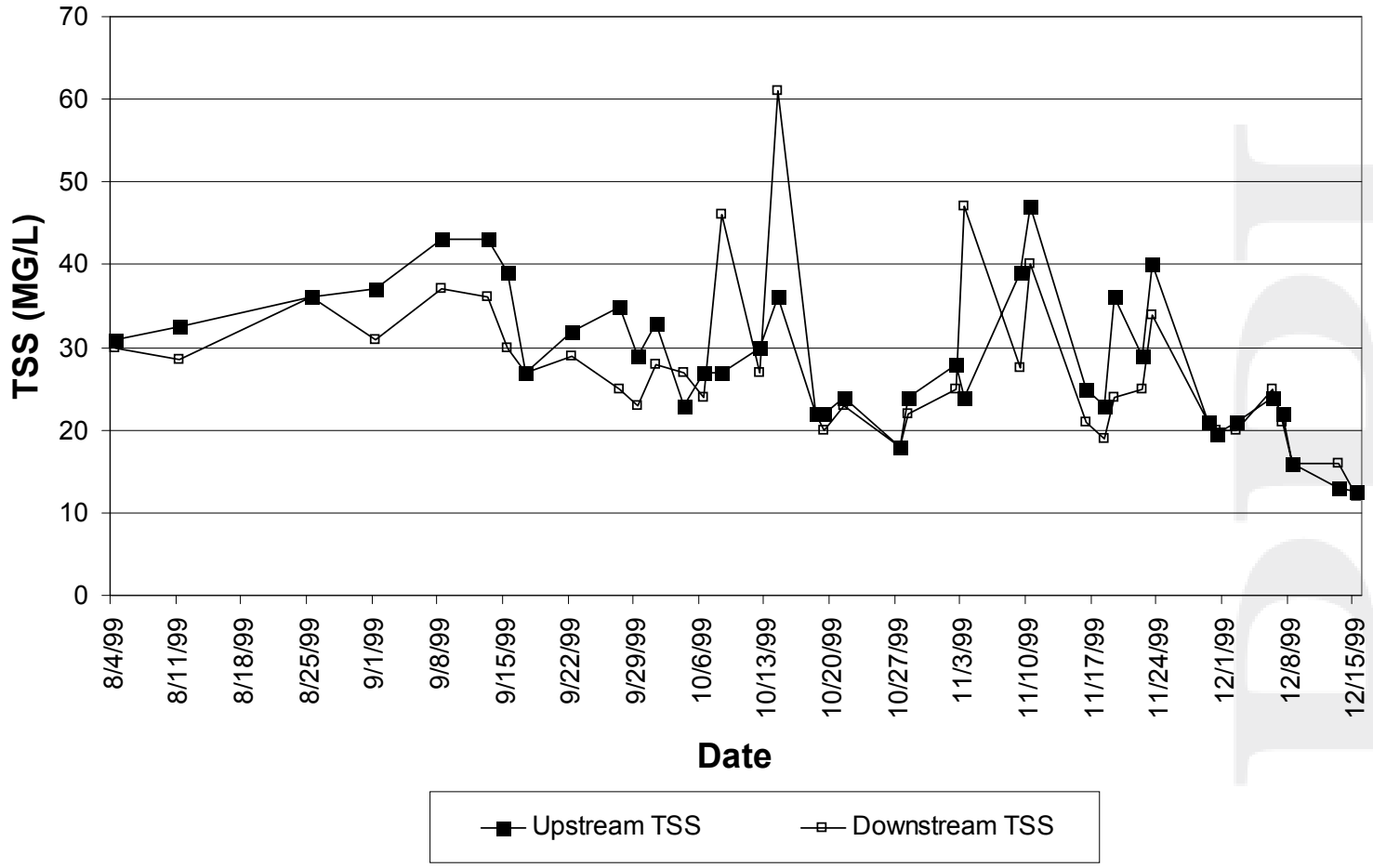
SMU 56/57 - 1999 Water Column TSS Concentration



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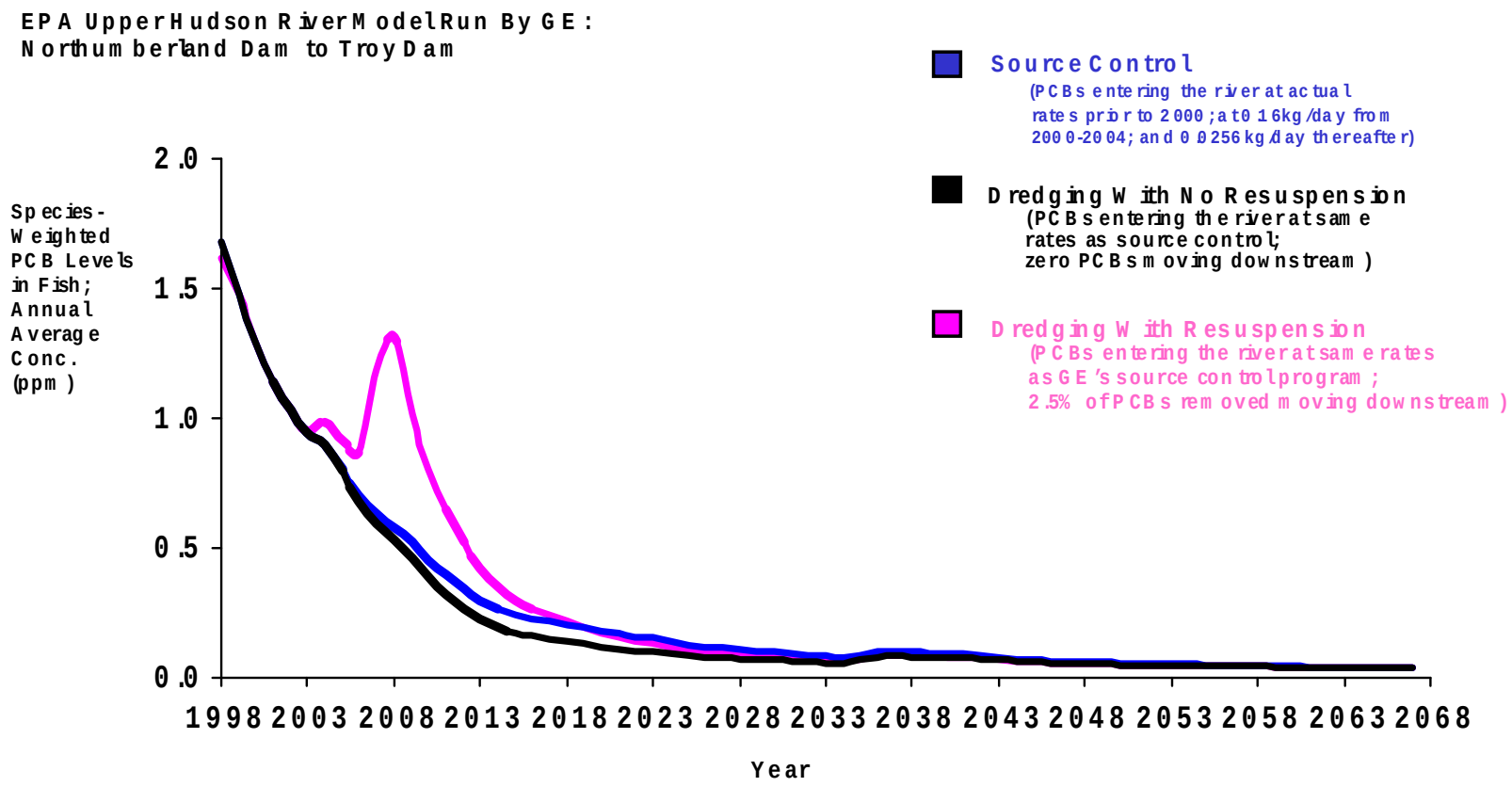
Modeling the Impacts of Sediment Resuspension on Dredging Effectiveness



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Conclusions

- Estimates of PCB releases during proposed environmental dredging projects are needed to compare remedial alternatives for PCB-contaminated sediment sites
- Dredging released PCBs to the river at a rate of 2% and higher of the PCB mass removed
- Turbidity and TSS measurements were not reliable indicators of PCB releases

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Fox River Demonstration Projects – Where to Read More

- BBL. 2000. *Fox River Dredging Projects at Sediment Deposit N and Sediment Management Unit 56/57 – Environmental Monitoring Report*, Syracuse, NY.
- Foth and Van Dyke. 2000. *Summary Report – Fox River Deposit N*, prepared for Wisconsin Department of Administration and Wisconsin Department of Natural Resources, Madison, WI.
- Fox River Remediation Advisory Team (FRRAT). 2000. Evaluation of Remediation Dredging: The Fox River Deposit N Demonstration Project, November 1998-January 1999. Water Resources Institute, University of Wisconsin, Madison, WI.
- Montgomery Watson. 2000. Summary Report – Sediment Removal Demonstration Project, Sediment Management Unit 56/57, Fox River, Green Bay, WI.
- USGS. 2000. A Mass Balance Approach for Assessing PCB Movement During Remediation of a PCB-Contaminated Deposit on the Fox River, Wisconsin. USGS Water Resources Investigations Report 00-4245.